UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/005,497	11/08/2001	Henri-Pierre Valero	26.0206	7991

23718 7590 06/13/2003

SCHLUMBERGER OILFIELD SERVICES
200 GILLINGHAM LANE
MD 200-9
SUGAR LAND, TX 77478

EXAMINER	
LE, TOAN M	
ART UNIT	PAPER NUMBER
2863	

DATE MAILED: 06/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application No. 10/005,497	Applicant(s) VALERO ET AL.
	Examiner Toan M Le	Art Unit 2863

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 April 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: peak 20 and peak 22 (figure 2).

A correction is required.

Specification

The disclosure is objected to because of the following informalities: equation 1, page 5, is not correct.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-12, 15-18, and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Kimball et al. (U.S. Patent No. 4,594,691).

Referring to claim 1, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein the waveform peaks are not classified prior to tracking (col. 11, lines 21-22; figures 9-10).

As to claim 2, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein the step of generating tracks comprises classifying long tracks; classifying small tracks; classifying tracks that overlap; filling in gaps; and creating a final logs (col. 14, lines 40-47; figures 9-11).

Referring to claim 3, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein filling in gaps further comprises using non-classified tracks to fill gaps (col. 14, lines 40-47).

As to claim 4, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein filling gaps further comprises performing interpolation (col. 14, lines 40-47).

Referring to claim 5, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole (Abstract, lines 7-8) comprising generating tracks from sonic waveform peaks received at a plurality of depths, wherein interpolation is linear (figure 11).

As to claim 6, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein linear interpolation is done if the gaps are less than 6 frames (figure 11).

Referring to claim 7, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein filling in gaps further comprising performing interpolation (figure 11).

As to claim 8, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein tracks are considered as individual objects comprising peaks (figures 9-10).

Referring to claim 9, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein peaks are defined using semblance, time, and slowness (Abstract, lines 7-8; figures 9-10).

As to claim 10, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein only time and slowness are used for classification (figures 9-10).

Referring to claim 11, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein a probability of a track being one of a compressional and shear is determined using all points forming the track (col. 7, lines 46-52; figure 4).

As to claim 12, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein classification of one track is independent of classification of a track different from that track (col. 7, lines 46-52; figure 4).

Referring to claim 15, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein the step of filling in the gaps further comprises: determining if there is a gap in a selected track at a depth range covered by the selected non-classified track; deleting the track if no gap is found; and filling the gap in the selected track after determining that the selected non-classified track can be used to fill the gap (col. 14, lines 40-47).

As to claim 16, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein determining if the selected track can be used to fill the gap is done by evaluating if the selected track is between upper part and lower part of a skeleton, wherein the skeleton comprises tracks that have been classified so far (col. 8, lines 30-53).

Referring to claims 17-18, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein the long track comprises more than 20 frames and wherein the small track comprises less than or equal to 20 frames (figures 9-11).

As to claim 23, Kimball et al. disclose a method incorporated into a computer system for determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein the waveform peaks are not classified prior to tracking (col. 11, lines 21-22), wherein the method comprises classifying long tracks, classifying small tracks, classifying tracks that overlap, filling in gaps and creating a final log (col. 14, lines 40-47), wherein the method is implemented in a program stored on a storage media and the output is applied to at least one output device (figures 1, 9-11).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 13-14, 19-22, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimball et al. (U.S. Patent No. 4,594,691) as applied to claims 1-12, 15-18, and 23 above, and further in view of Kimball (U.S. Patent No. 6,449,560).

Referring to claims 13 and 20-22, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole (Abstract, lines 7-8) comprising generating tracks from sonic waveform peaks received at a plurality of depths (col. 11, lines 21-22), wherein the step of generating tracks comprises classifying long tracks; classifying small

tracks; classifying tracks that overlap; filling in gaps; and creating a final logs (col. 14, lines 40-47; figures 9-11).

Kimball et al. do not teach the step of classifying the long tracks further comprises: fitting a distribution function on peaks of the track; calculating a mean and variance of the distribution; comparing distribution of the data with a distribution of a model data; and classifying the long track according to the model data if the comparison determines that the track data and model data are consistent and wherein slowness and time peaks are treated having Gaussian probability distribution measuring at one depth based on measurements at a previous depth and is done by a 2-D Kalman filter process.

Kimball discloses a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (col. 2, lines 25-28), wherein the step of generating tracks comprises classifying long tracks; classifying small tracks; classifying tracks that overlap; filling in gaps; and creating a final logs (col. 13, lines 39-46; col. 14, lines 12-21), wherein the step of classifying the long tracks further comprises: fitting a distribution function on peaks of the track (col. 14, lines 22-24); calculating a mean and variance of the distribution (col. 14, lines 32-33); comparing distribution of the data with a distribution of a model data (col. 14, lines 34-37); and classifying the long track according to the model data if the comparison determines that the track data and model data are consistent and wherein slowness and time peaks are treated having Gaussian probability distribution measuring at one depth based on measurements at a previous depth and is done by a 2-D Kalman filter process (col. 14, lines 38-46; figures 7 and 11-12).

Accordingly, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have applied a model as described in the Kimball reference into the method of Kimball et al. to improve sonic multiple waves processing technique in evaluating the location and production of hydrocarbon resources.

As to claims 14 and 19, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein the step of generating tracks comprises classifying long tracks; classifying small tracks; classifying tracks that overlap; filling in gaps; and creating a final logs (col. 14, lines 40-68; figures 9-11).

Kimball et al. do not teach the step of classifying the short tracks comprises: computing a 2-D median of the track, the median being a point defined by corresponding coordinates in a slowness and time domain; determining an intersection of the slowness and time domain with a model data distribution; defining the model in the slowness and time domain as an ellipse; and classifying the small track based on a position of the peak in relation to the model data wherein the model is one of a compressional model or shear model.

Kimball discloses a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (col. 2, lines 25-28), wherein the step of generating tracks comprises classifying long tracks; classifying small tracks; classifying tracks that overlap; filling in gaps; and creating a final logs (col. 13, lines 39-46; col. 14, lines 12-21), wherein the step of classifying the short tracks further comprises: computing a 2-D median of the track, the median being a point defined by corresponding coordinates in a slowness and time domain (col. 2, lines 35-36 and 56-58);

determining an intersection of the slowness and time domain with a model data distribution (col. 14, lines 35-38); defining the model in the slowness and time domain as an ellipse (figures 11-12); and classifying the small track based on a position of the peak in relation to the model data wherein the model is one of a compressional model or shear model (col. 14, lines 42-44; figures 11-12).

Accordingly, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have applied a model as described in the Kimball reference into the method of Kimball et al. to improve sonic multiple waves processing technique in evaluating the location and production of hydrocarbon resources.

Referring to claim 24, Kimball et al. disclose a method of determining the sonic slowness of a formation traversed by a borehole comprising generating tracks from sonic waveform peaks received at a plurality of depths (Abstract, lines 7-8), wherein the step of generating tracks comprises classifying long tracks; classifying small tracks; classifying tracks that overlap; filling in gaps further comprising determining if there is a gap in a selected track at a depth range covered by a selected non-classified track, deleting the track if no gap is found, and filling the gap in the selected track after determining that the selected non-classified track can be used to fill the gap; and creating a final logs (col. 14, lines 40-47; figures 9-11).

Kimball et al. do not teach the step of a) classifying long tracks further comprising fitting a distribution function on peaks of the track; calculating a mean and variance of the distribution; comparing distribution of the data with a distribution of a model data; and classifying the long track according to the model data if the comparison determines that the track data and model data are consistent; b) classifying small tracks further comprising computing a 2-D median of the

track, the median being a point defined by corresponding coordinates in a slowness and time domain; determining an intersection of slowness and time domain with a model data distribution; defining the model in the slowness and time domain as an ellipse; and classifying the small track based on a position of the peak in relation to the model data.

Kimball teaches teach the step of a) classifying long tracks further comprising fitting a distribution function on peaks of the track (col. 14, lines 22-24); calculating a mean and variance of the distribution (col. 14, lines 32-33); comparing distribution of the data with a distribution of a model data (col. 14, lines 34-37); and classifying the long track according to the model data if the comparison determines that the track data and model data are consistent (col. 14, lines 38-46); b) classifying small tracks further comprising computing a 2-D median of the track, the median being a point defined by corresponding coordinates in a slowness and time domain (col. 2, lines 35-36 and 56-58); determining an intersection of slowness and time domain with a model data distribution (col. 14, lines 35-38); defining the model in the slowness and time domain as an ellipse (figures 11-12); and classifying the small track based on a position of the peak in relation to the model data (col. 14, lines 42-44; figures 11-12).

Accordingly, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have applied a model as described in the Kimball reference into the method of Kimball et al. to improve sonic multiple waves processing technique in evaluating the location and production of hydrocarbon resources.

Remarks:

Response to Arguments

Applicant's arguments filed 4/9/03 have been fully considered but they are not persuasive.

Referring to claim 1, Applicants argue that "The '691 Patent teaches a method of determining sonic slowness based on classified peaks: it does not teach the method of claim 1 and its dependent claims in the present application wherein waveform peaks <u>are not classified</u> prior to tracking."

The Abstract of '691 Patent states "Disclosed is sonic well logging which gives good results both in open and in cased boreholes. New use is made of the energy content output from a multi-receiver tool to find a coherence measure for the received sonic energy and to find peaks of that coherence measure at each depth level so as to produce a number of new logs of parameters of those peaks. Examples are a slowness/time coherence log for those peaks…". Thus, the waveform peaks in the '691 Patent are not classified prior to tracking.

Applicants further argue that "In particular the "(2) slowness/time coherence log discussed above" directly entails step 106 of figure 5, finding "coherence measure R^2 (T,D) in permitted band". Thus, the logs to which the cited passage from the '691 Patent refers have already been classified."

In the '691 Patent, column 8, lines 30-35, "As an example, the range of slowness can be restricted to bounds within arrivals which are commonly expected-e.g., values of 40 to 190 microsec/ft are suitable for locating compressional and shear arrivals, and values of 40 to 250 microsec/ft are suitable for locating fluid mode arrivals as well.". Thus, the waveform peaks in the '691 Patent are not classified prior to tracking.

Applicants also argue that "Further, with respect to claim 2, '691 Patent does not teach 1) classifying long tracks; 2) classifying small tracks; 3) classifying tracks that overlap; filling in gaps; and creating a final log."

In the '691 Patent, column 8, lines 30-35, "As an example, the range of slowness can be restricted to bounds within arrivals which are commonly expected-e.g., values of 40 to 190 microsec/ft are suitable for locating compressional and shear arrivals, and values of 40 to 250 microsec/ft are suitable for locating fluid mode arrivals as well.". In addition, column 14, lines 19-23, "For example, if transmitted sonic signal is at 10 KHz then said interpolation retains the accuracy of the ultimate results when the receiver outputs are sampled at about 100 KHz or more.". Thus, the '691 Patent does not teach 1) classifying long tracks; 2) classifying small tracks; 3) classifying tracks that overlap; filling in gaps; and creating a final log.

Applicants further argue that "The '691 Patent teaches a method that involves producing sonic logs on the basis of selected parameters of coherence peaks. The '560 Patent describes the shortcoming in windowing sonic waveforms using peak mask or maps such as described in the '691 Patent." and that "such a combination does not teach or suggest the present invention nor would such a combination perform the function of the present invention.".

Slowness-time-coherence (STC) is a full waveform analysis technique, which aims to find all propagating waves in the composite waveform. The processing adopts a semblance algorithm to detect arrivals that are coherent across the array of receivers and estimates their slowness. The basic algorithm advances a fixed-length time window across the waveforms in small, overlapping steps through a range of potential arrival times. For each time position, the window position is moved out linearly in time, across the array of receiver waveforms, beginning

with a moveout corresponding to the fastest wave expected and stepping to the slowest wave expected. Foe each movout, a coherence function is computed to measure the similarity of the waves within the window. When the window time and the moveout correspond to the arrival time and slowness of a particular component, the waveforms within the window are almost identical, yielding a high value of coherence. In this way, the set of waveforms from the array is examined over a range of possible arrival times and slowness for wave components. STC processing produces coherence (semblance) contour plots in the slowness/arrival time plane. Regions of large coherence correspond to particular arrivals in the waveforms. The slowness and arrival time at each coherence peak are compared with the propagation characteristics expected of the arrivals being sought and the ones that best agree with these characteristics are retained. Classified the arrival times in this manner produces a continuous log of slowness versus depth. The '560 Patent discloses a propagator matrix as a function of the model describing the moving/propagating waveforms for fitting, calculating, comparing, and classifying a track within a time window. Thus, a combination of '691 and '560 Patents is relevant.

Conclusion

THIS ACTION IS MADE FINAL.

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toan M Le whose telephone number is (703) 305-4016. The examiner can normally be reached on Monday through Friday from 9:00 A.M. to 5:30 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on (703) 308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0655.

Toan Le

June 11, 2003

John Barlow
Supervisory Patent Examiner
Technology Center 2800